

E1
1. (Amended Three Times) A method of improving the expression in a dicot plant of a Bacillus thuringiensis delta-endotoxin protein natively between about 130 and 140 kD in size, the method comprising the steps of:

(a) analyzing the pattern of nucleotide codon usage in native plant genes having relatively high levels of expression in plants to select from among the codons coding for the same amino acid the codons for each amino acid which are utilized preferentially by the native plant genes;

(b) synthesizing a chimeric nucleotide coding sequence coding for the expression of the amino acid sequence of the about 130 to 140 kD protein delta-endotoxin from Bacillus thuringiensis with the chimeric coding sequence comprising at least a first 5' 25 codons differing from those in the coding sequence in Bacillus thuringiensis and selected from among the codons determined from Figure 1 to be preferentially utilized by the native plant genes;

(c) joining the chimeric nucleotide coding sequence with flanking regulatory sequences effective to express the chimeric coding sequence in plants; and

(d) transforming the chimeric coding sequences together with the regulatory sequences into the germ line of the dicot plant so that the delta-endotoxin protein is produced in cells of the transformed plant so that the plant is toxic upon ingestion to Manduca sexta.

E2
15. (Twice Amended) A transgenic dicot plant comprising in its genome a gene coding for the amino-terminal portion of the about 130 to 140 kD delta-endotoxin gene of Bacillus thuringiensis, the gene including appropriate regulatory sequences to express the coding region so that cells of the plant produce the delta-endotoxin protein so as to be toxic upon ingestion by Manduca sexta, the coding sequence of the gene including a 5' region of at least 150 nucleotides in length constructed as an oligonucleotide from nucleotide codons selected from those codons determined from Figure 1 to be efficiently expressed in the cells of plants, the sequence of and pattern of codons being different from those in the coding region of the gene in Bacillus thuringiensis.

E3
17. (Amended Three Times) A transgenic dicot plant comprising in its genome a gene coding for the amino terminal toxin encoding portion of

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the about 130 to 140 kD delta endotoxin from Bacillus thuringiensis, the gene including appropriate regulatory sequences effective in plant cells to express a coding region so that cells of the plant produce the delta endotoxin toxin protein in sufficient amount to be toxic upon ingestion to Manduca sexta, the coding region of the gene including a synthesized 5' region of between 25 and 132 codons in length constructed from nucleotide sequences selected from those codons determined from Figure 1 to be efficiently expressed in the cells of plants and a 3' region comprising the native sequence from Bacillus thuringiensis.

18. (Twice Amended) A transgenic dicot plant comprising in its genome a gene coding for the amino terminal toxin portion of the about 130 to 140 kD delta endotoxin gene from Bacillus thuringiensis, the gene including appropriate regulatory sequences effective in plant cells to express a coding region, the coding region having a 5' portion identical to the sequence of BT4 listed as the top sequence in Figure 2 and a 3' portion identical to the native sequence from Bacillus thuringiensis HD-1 Dipel ssp. kurstaki.

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19. (New) A DNA molecule comprising a gene including a protein coding sequence derived from the amino-terminal portion of the gene from Bacillus thuringiensis encoding the about 130 to 140 kD delta-endotoxin, the gene including appropriate regulatory sequences to express the protein coding sequence so that cells of a plant hosting the gene produce delta-endotoxin protein so as to be toxic upon ingestion by Manduca sexta, the protein coding sequence of the gene including a 5' region of at least 150 nucleotides in length constructed from nucleotide codons selected from those codons determined from Figure 1 to be efficiently expressed in the cells of plants, the sequence of and pattern of codons being different from those in the protein coding sequence of the gene in Bacillus thuringiensis.

Remarks

This Amendment is made in to the Office Action dated October 2, 1992 in the file of the above identified patent application. In that Office Action, the claims of this application were rejected both for lack of enablement,